The Use of CERES/ERBE data at NCEP/CPC

** Evaluating MRF using CERES*

** Arctic Oscillation and OLR*

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On 18 May 2001 changes to the following areas in the MRF analysis/forecast system were implemented:

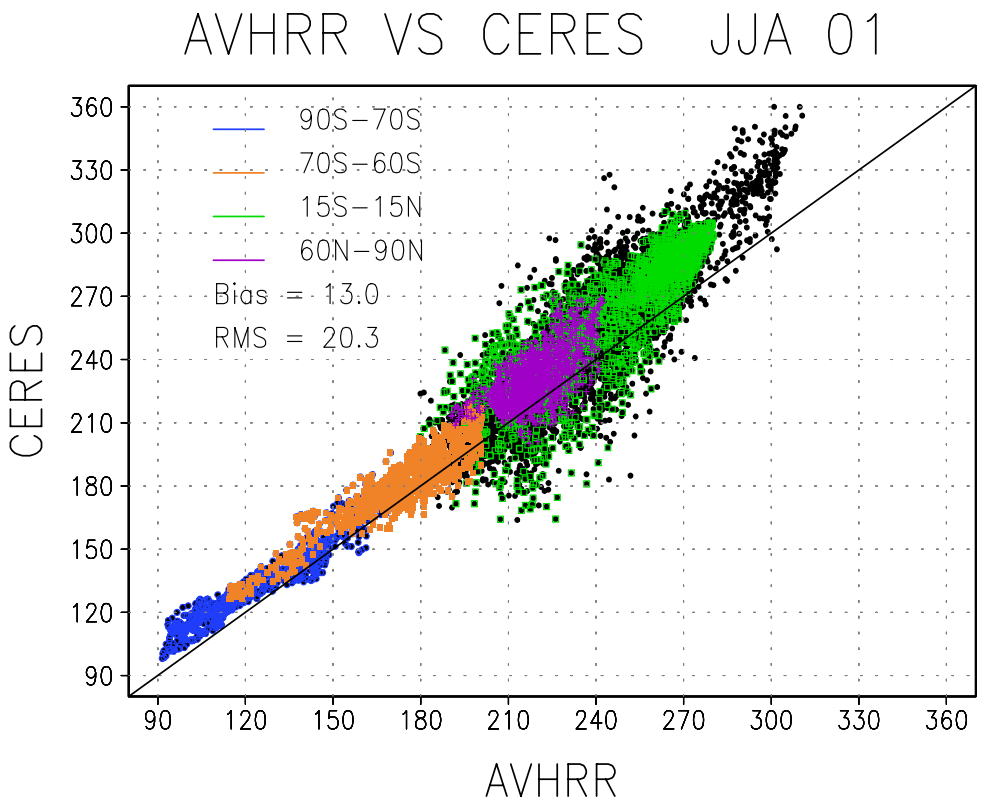
Physics

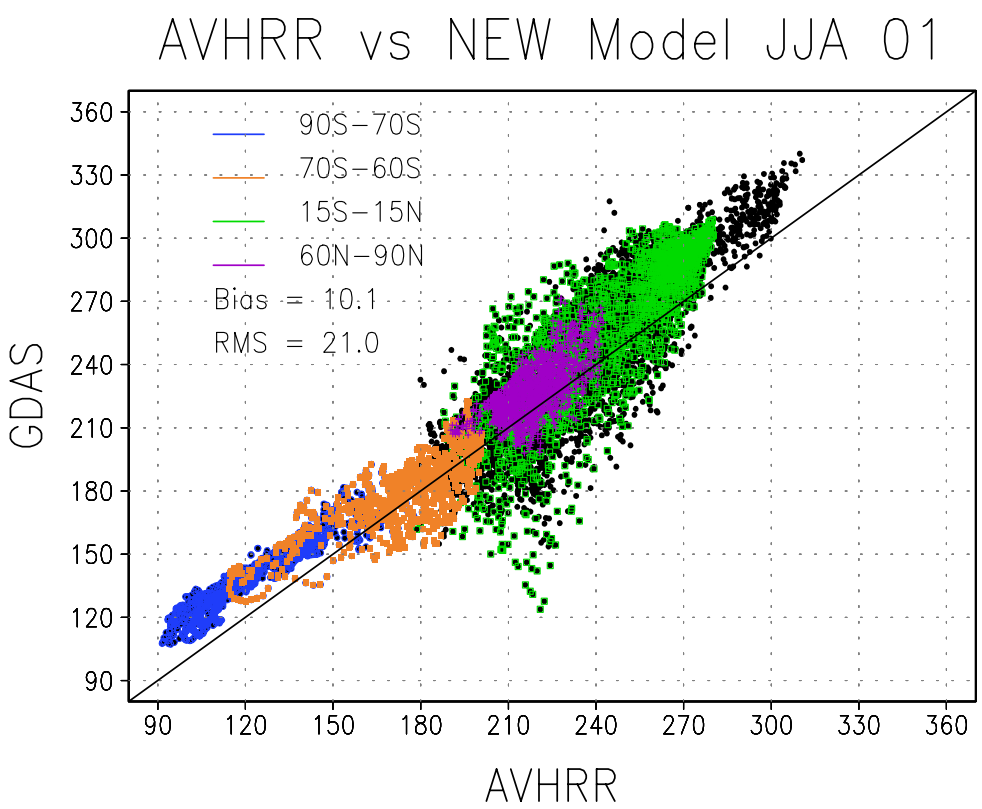
- **Inclusion of cloud condensate as a history variable**
- **Use of the cloud condensate in the calculation of radiative transfer**
- **Inclusion of cumulus momentum mixing**

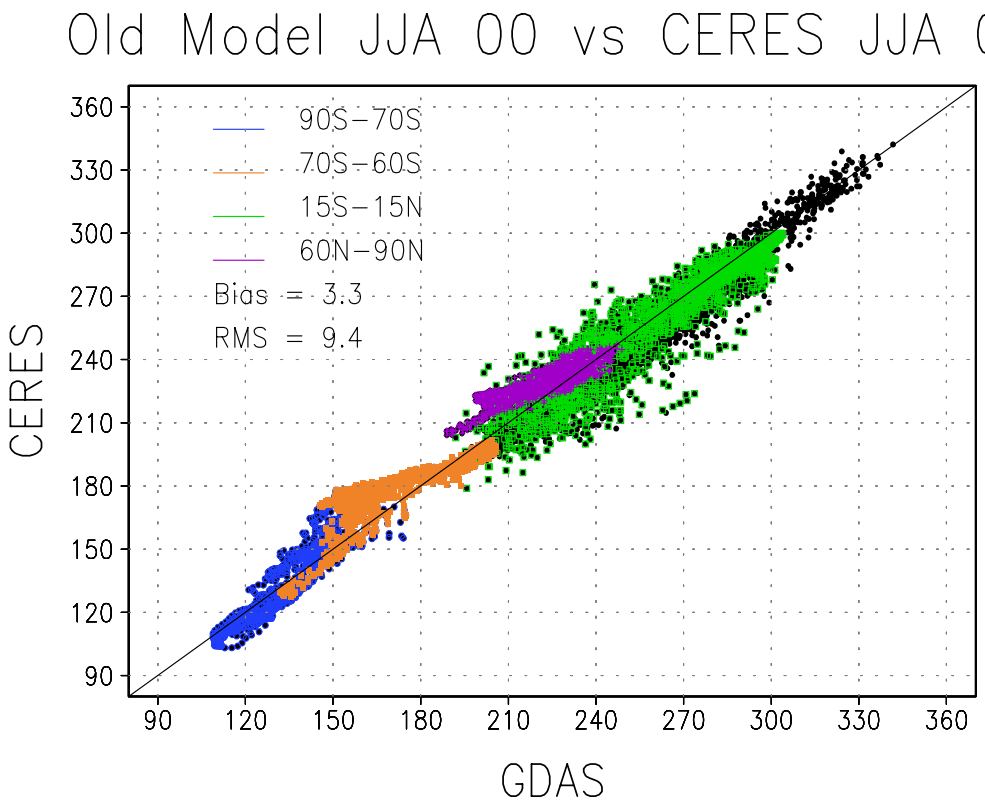
Analysis

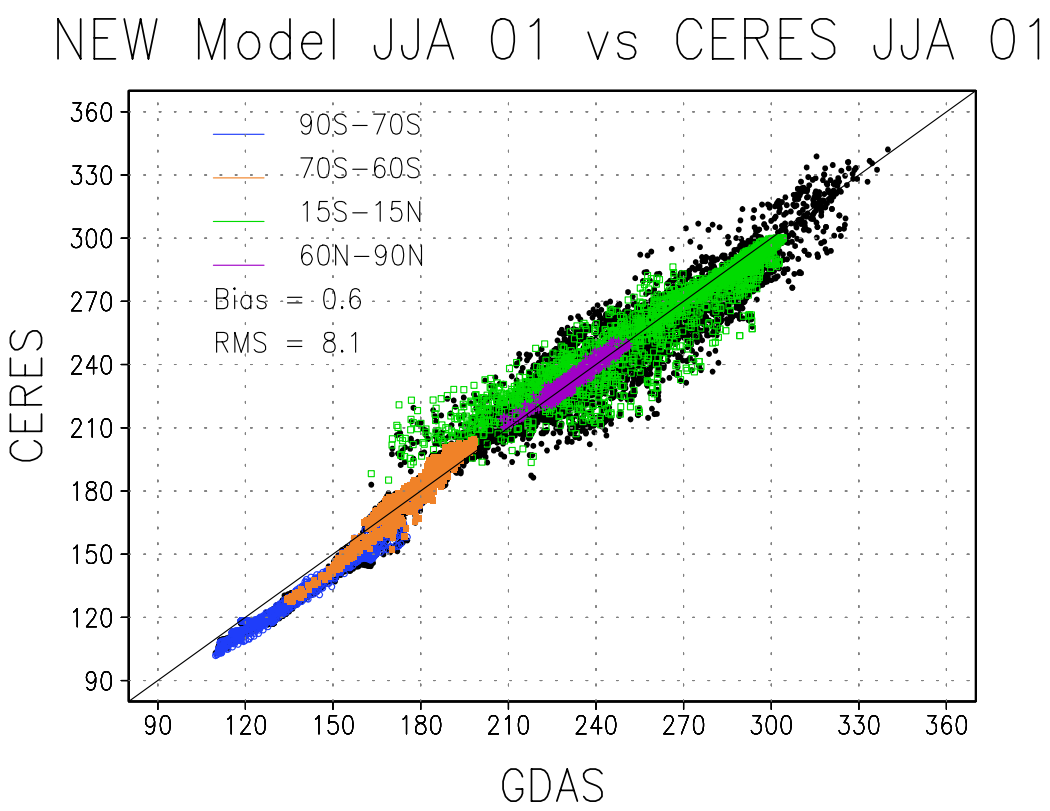
- **Stronger quality control for AMSU radiance**
- **Refinement of hurricane relocation algorithm**

This package of changes has produced improvement in circulation patterns in both the extra-tropics and the tropics, and a significant reduction of the false alarm rate for tropical storms. It has also changed significantly the model's temperature bias.

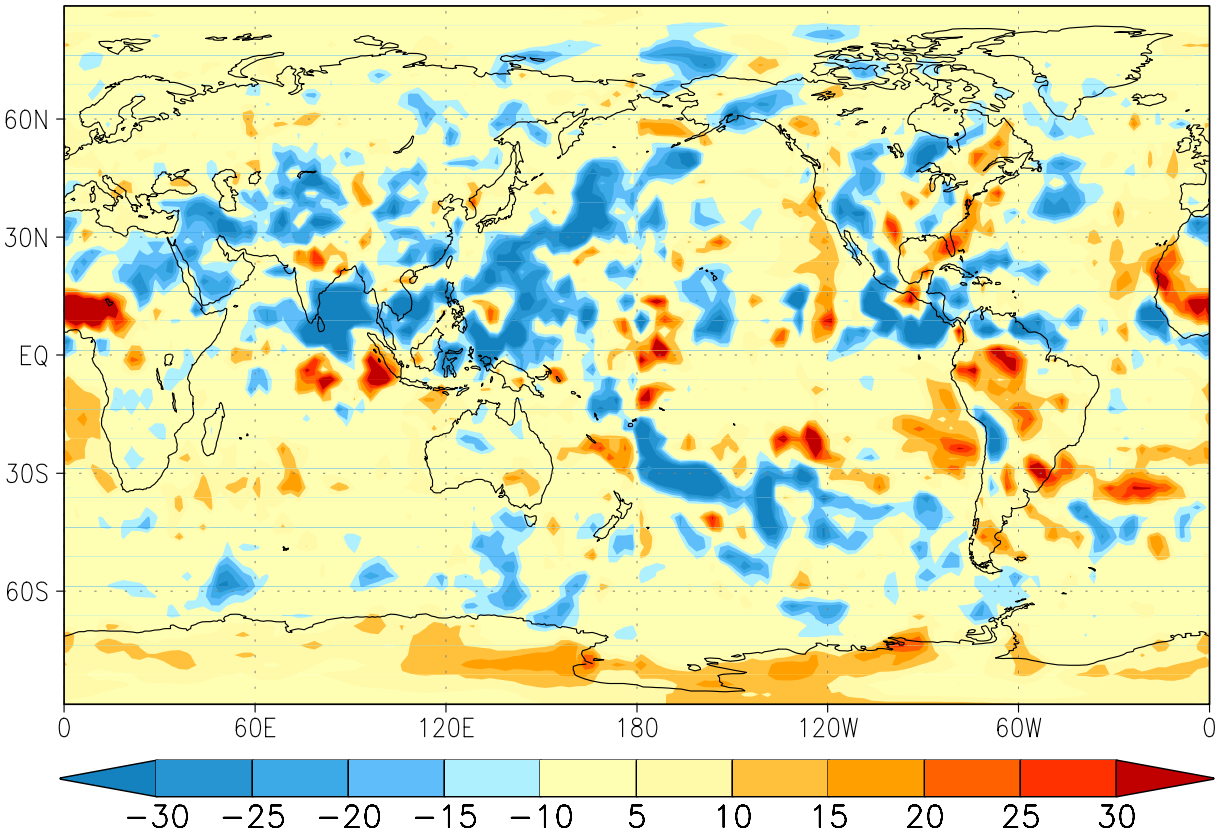

AVHRR VS CERES JJA 01
90S-70S
70S-60S
15S-15N
60N-90N
Bias = 13.0
RMS = 20.3
CERES
AVHRR
90
120
150
180
210
240
270
300
330
360


AVHRR vs NEW Model JJA 01
90S-70S
70S-60S
15S-15N
60N-90N
Bias = 10.1
RMS = 21.0
GDAS
AVHRR
90
120
150
180
210
240
270
300
330
360

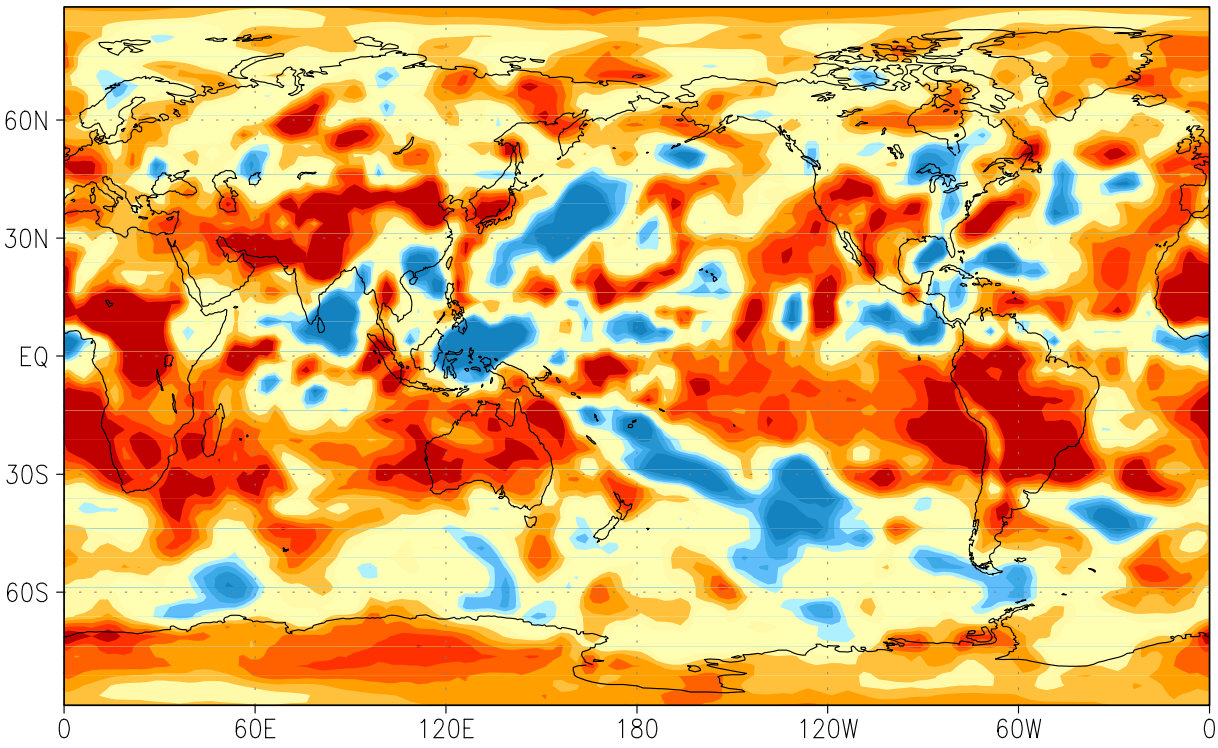

Old Model JJA 00 vs CERES JJA 00
90S-70S
70S-60S
15S-15N
60N-90N
Bias = 3.3
RMS = 9.4
CERES
GDAS
90
120
150
180
210
240
270
300
330
360


NEW Model JJA 01 vs CERES JJA 01
90S-70S
70S-60S
15S-15N
60N-90N
Bias = 0.6
RMS = 8.1
CERES
GDAS
90
120
150
180
210
240
270
300
330
360

GDAS – CERES JJA '01

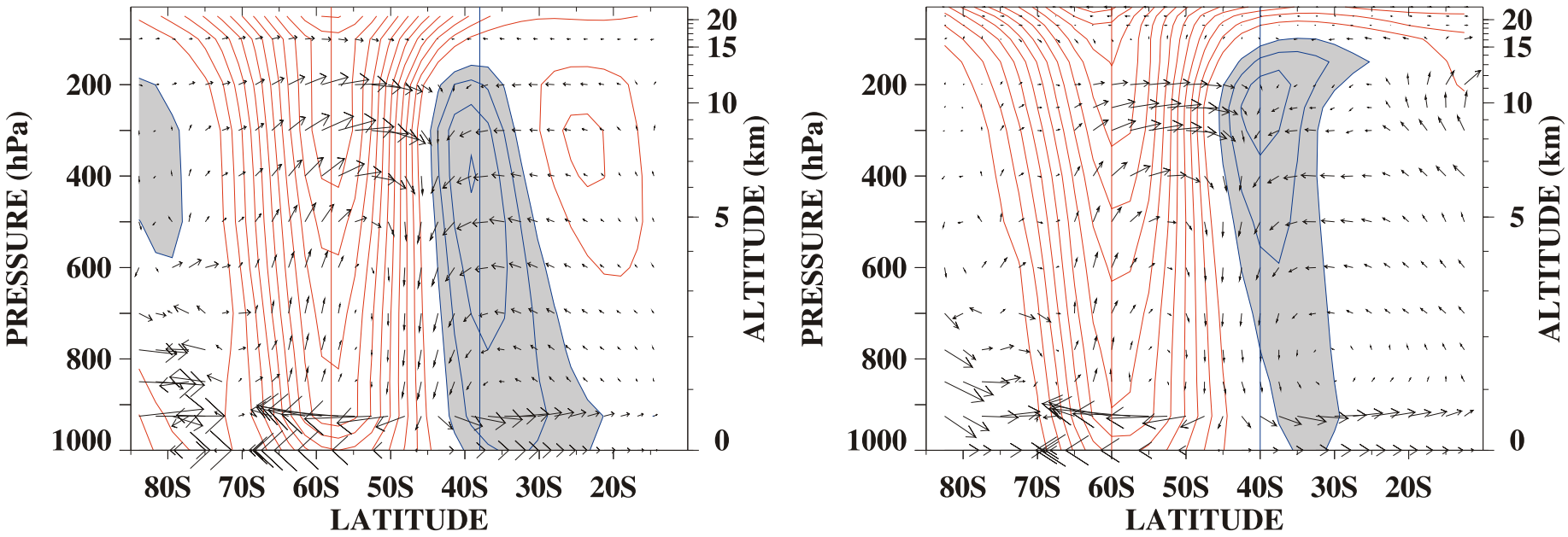


GDAS – AVHRR JJA '01

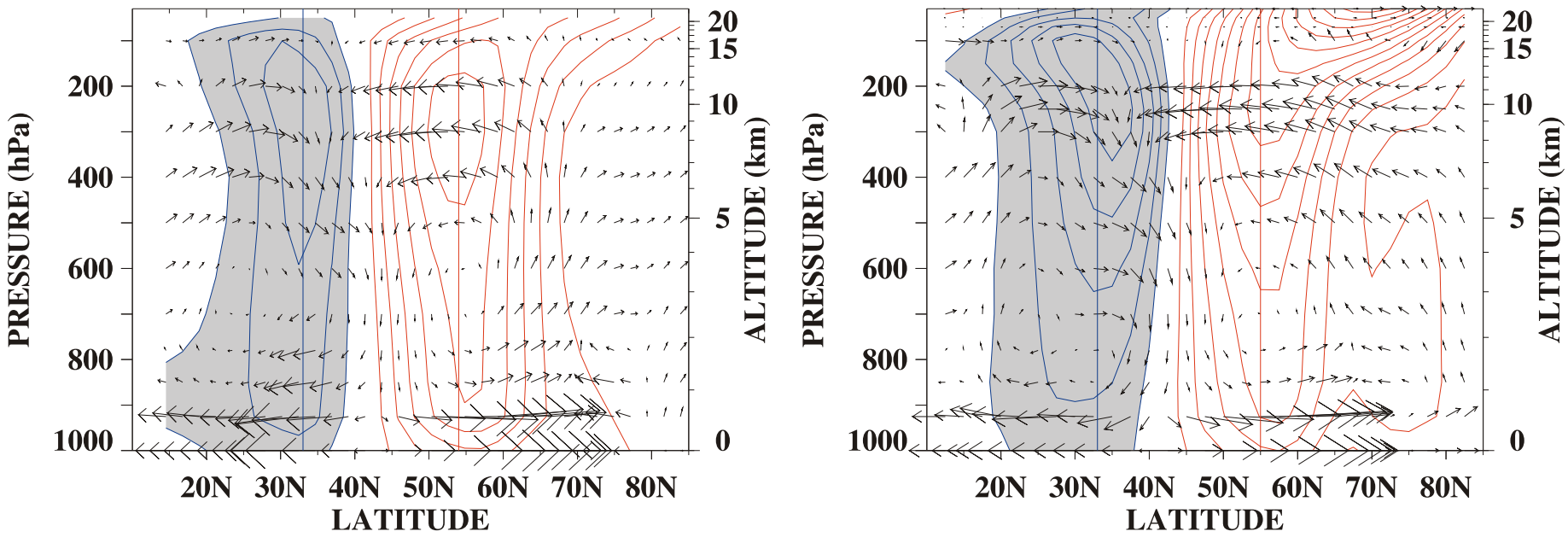


Summary:

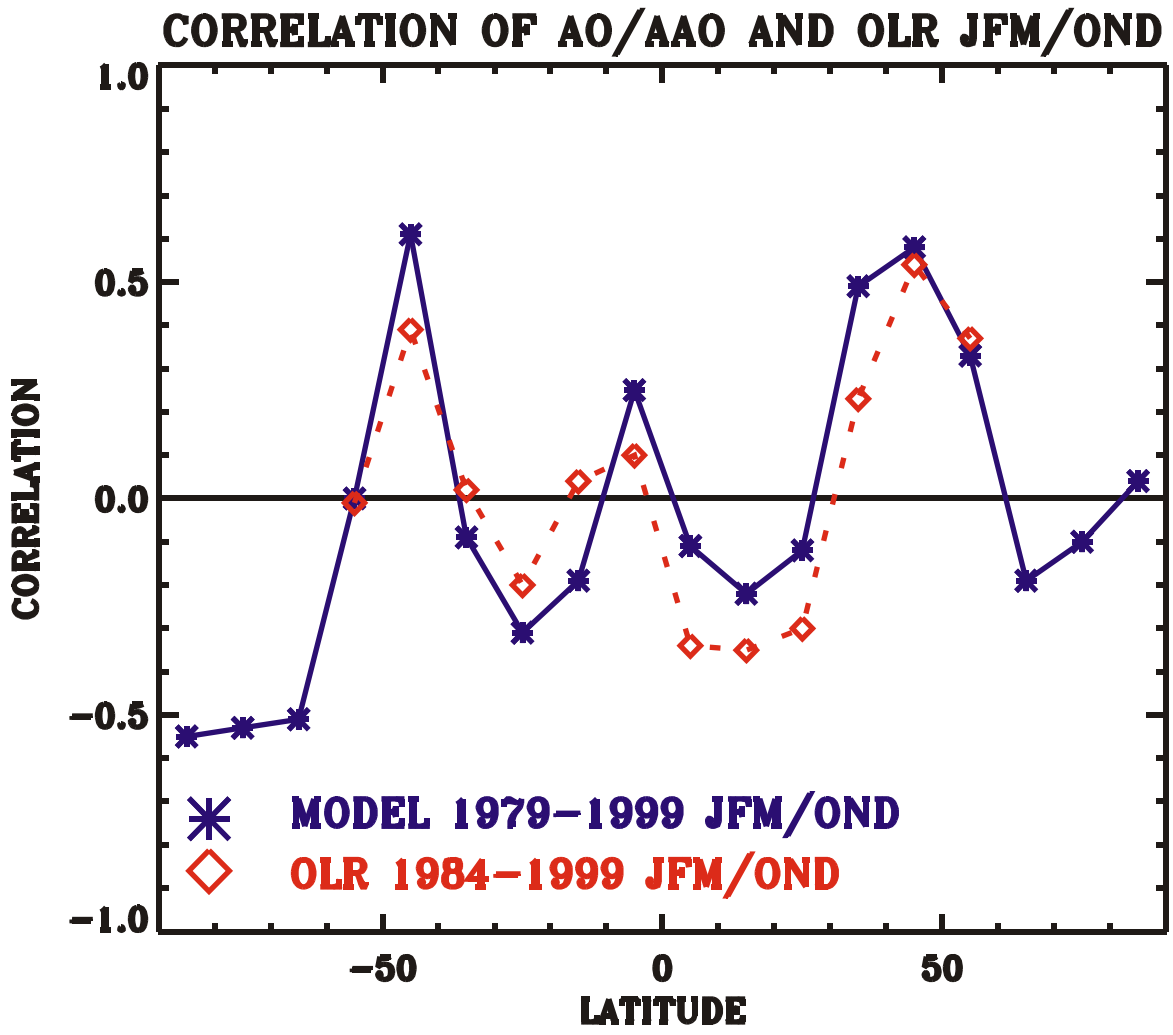
- **CERES provides valuable information for adjusting new cloud/radiation algorithms.**
- **AVHRR OLR poses significant bias ~ -10 W/M^2.**
- **New prognostic cloud algorithm eliminated erroneous stratification in the mid-high latitudes from the old diagnostic scheme, and reduces biases.**
- **Will continue to use CERES cloud products for further evaluation. LW RRTM of AER is on the parallel runs.**

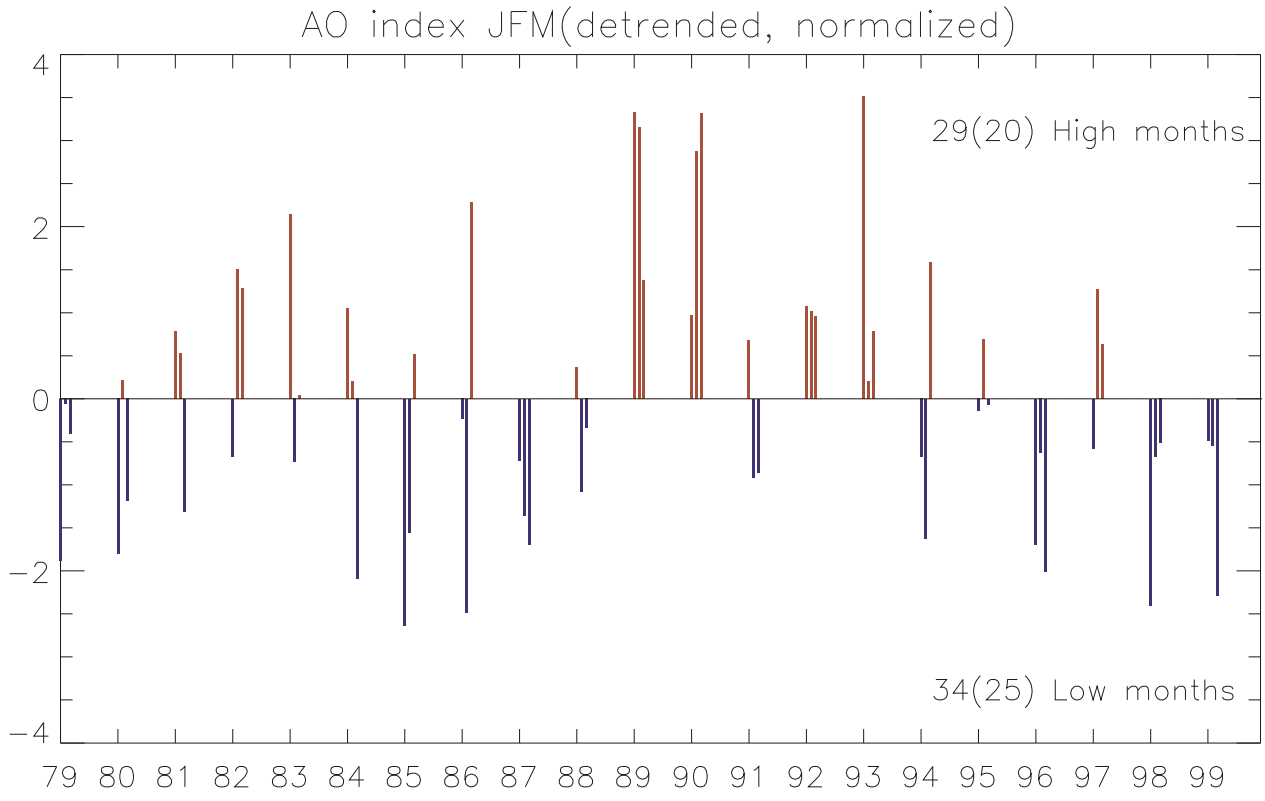


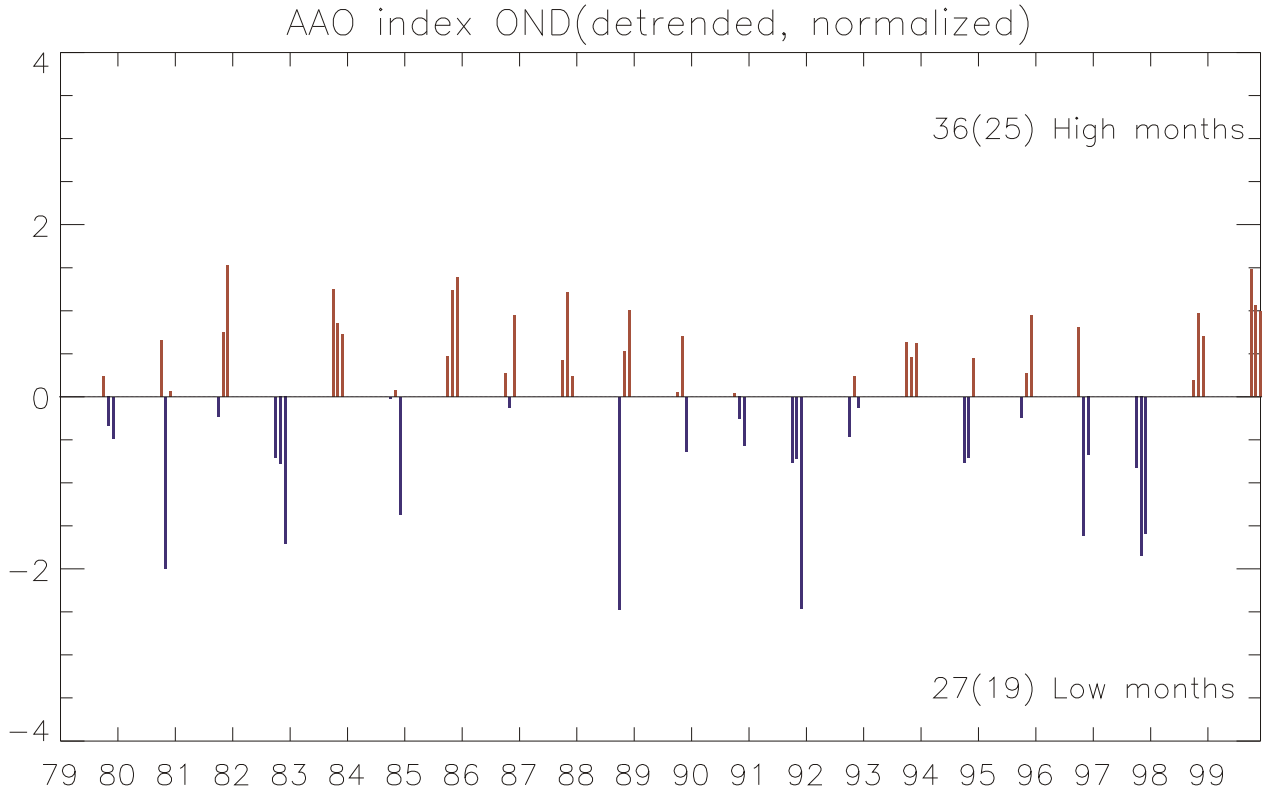
From L & H (2001), SAM wind (contours) and mean meridional circulation (vectors). High-Low composite. Left: GFDL; Right NCAR/NCEP

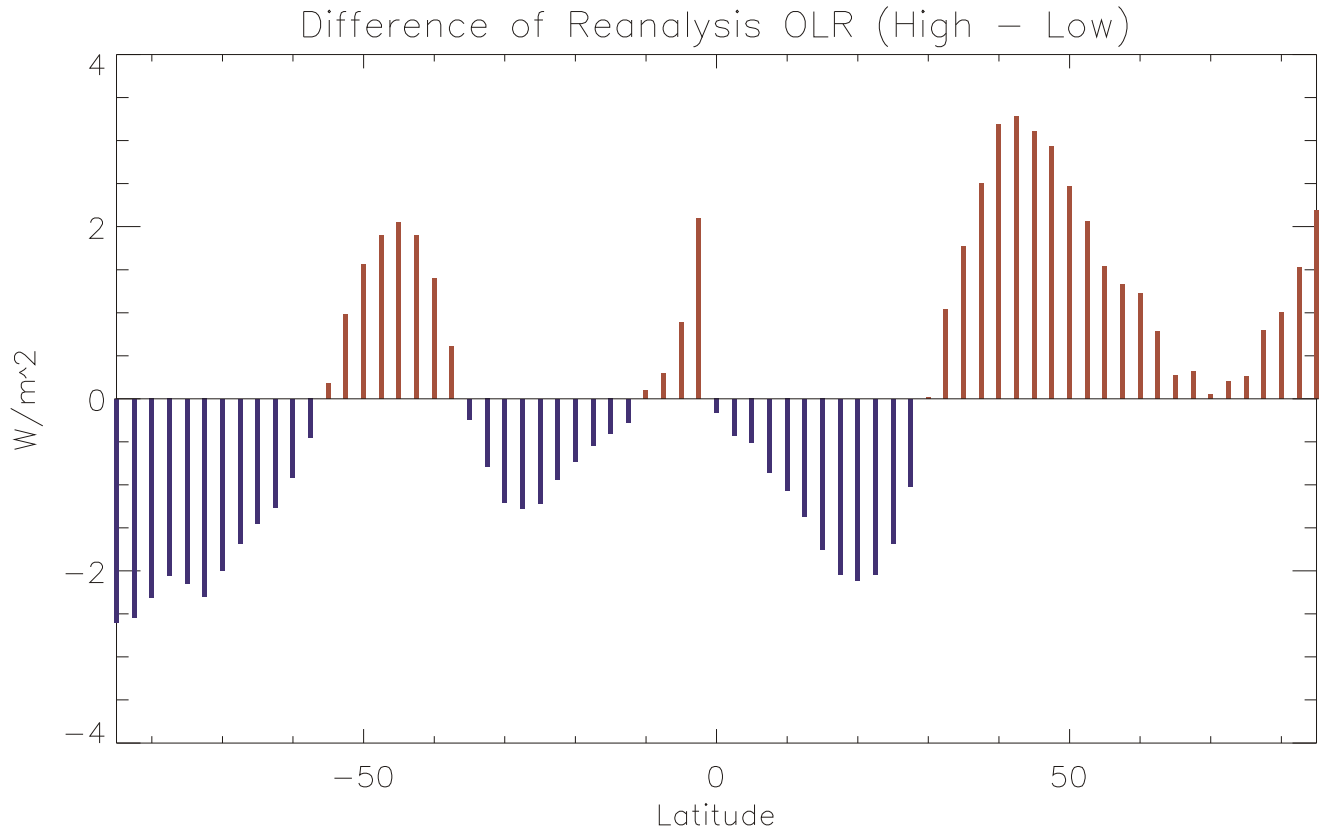


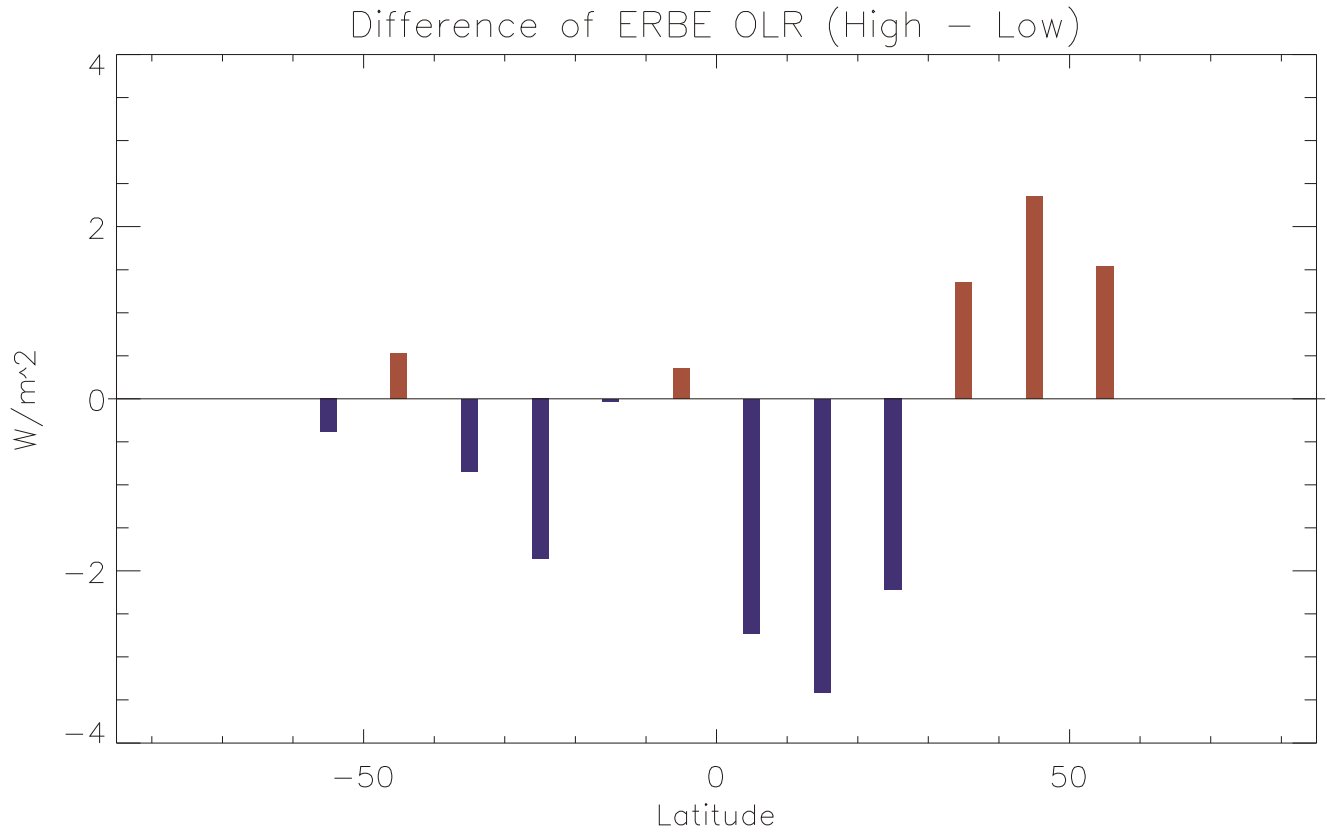
From L & H (2001), NAM wind (contours) and mean meridional circulation (vectors).
High-Low composite. Left: GFDL; Right NCAR/NCEP

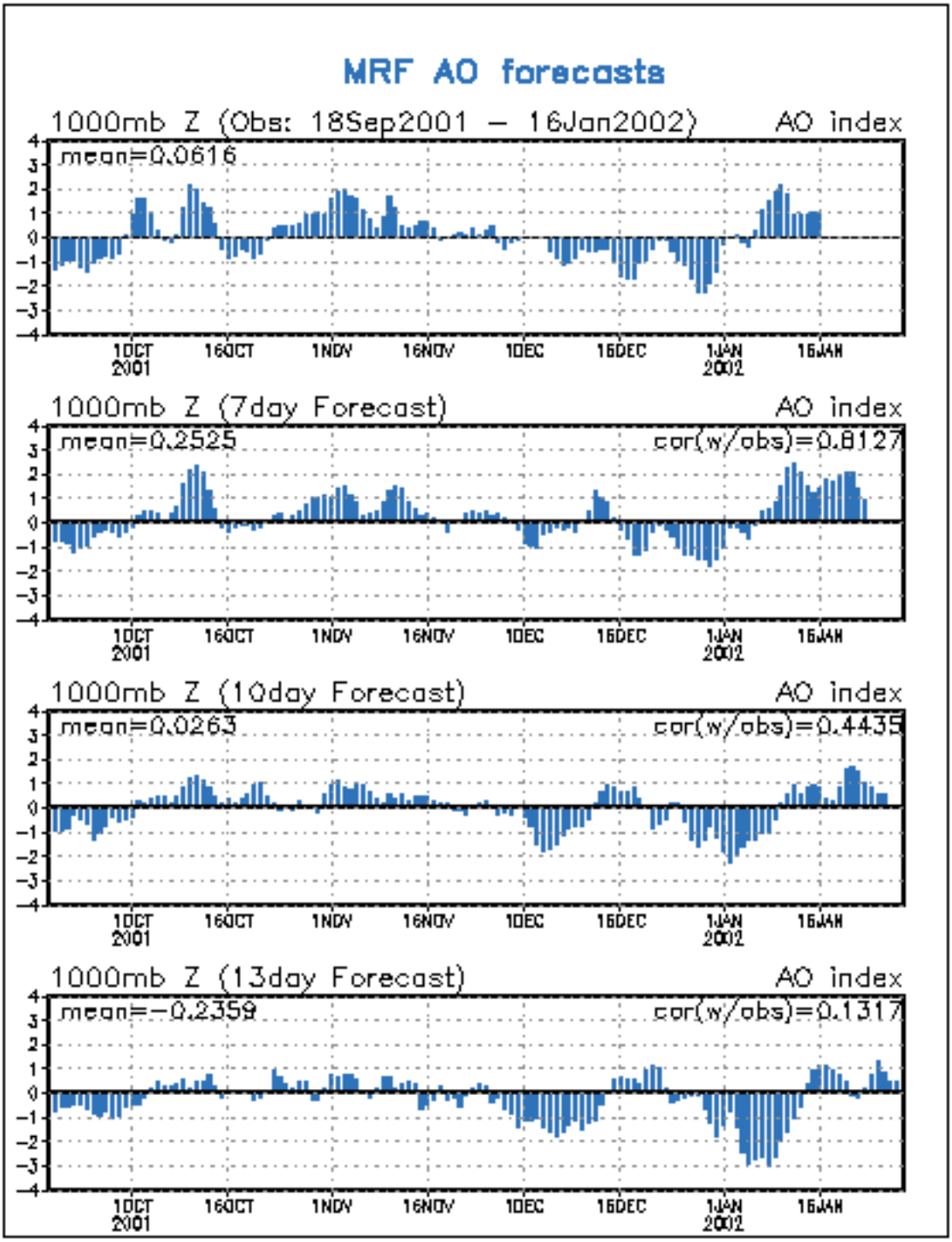

CORRELATION OF AO/AAO AND OLR JFM/OND
1.0
0.5
0.0
−0.5
−1.0
CORRELATION
−50
0
50
LATITUDE
MODEL 1979−1999 JFM/OND
OLR 1984−1999 JFM/OND


AO index JFM(detrended, normalized)
29(20) High months
34(25) Low months
4
2
0
−2
−4
79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99


AAO index OND(detrended, normalized)
36(25) High months
27(19) Low months
4
2
0
−2
−4
79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99


Difference of Reanalysis OLR (High − Low)
4
2
0
−2
−4
W/m^2
−50
0
50
Latitude


Difference of ERBE OLR (High − Low)
4
2
0
−2
−4
W/m^2
−50
0
50
Latitude


MRF AO forecasts
1000mb Z (Obs: 18Sep2001 – 16Jan2002)
AO index
mean=0.0616
1000mb Z (7day Forecast)
AO index
mean=0.2525
cor(w/obs)=0.8127
1000mb Z (10day Forecast)
AO index
mean=0.0263
cor(w/obs)=0.4435
1000mb Z (13day Forecast)
AO index
mean=-0.2359
cor(w/obs)=0.1317
4
3
2
1
0
-1
-2
-3
-4
1OCT 2001
16OCT
1NOV
16NOV
1DEC
16DEC
1JAN 2002
16JAN

Summary:

- **ERBE WFOV OLR provides an independent test of analysis/model-derived AO relationship.**
- **Monthly AO index and OLR composite correlated well in the latitudes with strong vertical motions.**
- **Weaker lead-lag correlation with OLR on monthly basis**
- **Need to study shorter temporal scales (using CERES daily -> weekly data) AO and Net Radiation for lead-lag relationships.**